

**Study Guide**

For use with pages 219–224

**GOAL** Write fractions as decimals and vice versa.**VOCABULARY**

A **rational number** is a number that can be written as a quotient of two integers. In a **terminating decimal**, the division ends because you obtain a final remainder of zero. In a **repeating decimal**, a digit or block of digits in the quotient repeats without end.

**EXAMPLE 1** Identifying Rational Numbers

Show that the number is rational by writing it as a quotient of two integers.

a. 9

b.  $3\frac{5}{12}$

c.  $-8\frac{2}{7}$

**Solution**

a. Write the integer 9 as  $\frac{9}{1}$ .

b. Write the mixed number  $3\frac{5}{12}$  as the improper fraction  $\frac{41}{12}$ .

c. Think of  $-8\frac{2}{7}$  as the opposite of  $8\frac{2}{7}$ . First write  $8\frac{2}{7}$  as  $\frac{58}{7}$ . Then you can write  $-8\frac{2}{7}$  as  $-\frac{58}{7}$ . To write  $-\frac{58}{7}$  as a quotient of two integers, you can assign the negative sign to either the numerator or the denominator. You can write  $-\frac{58}{7}$  or  $\frac{58}{-7}$ .

**Exercises for Example 1**

Show that the number is rational by writing it as a quotient of two integers.

1. -84

2. 12

3.  $2\frac{8}{17}$

4.  $-5\frac{2}{9}$

**EXAMPLE 2** Writing Fractions as Decimals

a. Write  $\frac{7}{8}$  as a decimal.

b. Write  $\frac{4}{11}$  as a decimal.

**Solution**

$$\begin{array}{r} 0.875 \\ 8 \overline{)7.000} \\ \underline{64} \phantom{00} \\ 60 \phantom{00} \\ \underline{56} \phantom{00} \\ 40 \phantom{00} \\ \underline{40} \phantom{00} \\ 0 \end{array}$$

The remainder is 0, so the decimal is a terminating decimal:  
 $\frac{7}{8} = 0.875$ .

$$\begin{array}{r} 0.3636 \dots \\ 11 \overline{)4.0000} \\ \underline{33} \phantom{00} \\ 70 \phantom{00} \\ \underline{66} \phantom{00} \\ 40 \phantom{00} \\ \underline{33} \phantom{00} \\ 70 \end{array}$$

Use a bar to show the repeating digits in the repeating decimal:  
 $\frac{4}{11} = 0.\overline{36}$ .

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**Exercises for Example 2**

Write the fraction or mixed number as a decimal.

5.  $\frac{4}{9}$

6.  $1\frac{4}{5}$

7.  $-2\frac{9}{16}$

8.  $-\frac{8}{11}$

**EXAMPLE 3 Writing Terminating Decimals as Fractions**

a.  $0.9 = \frac{9}{10}$  Place value of 9 is tenths, so denominator is 10.

b.  $0.31 = \frac{31}{100}$  Place value of 1 is hundredths, so denominator is 100.

**EXAMPLE 4 Writing a Repeating Decimal as a Fraction**To write  $0.\overline{45}$  as a fraction, let  $x = 0.\overline{45}$ .(1) Because  $0.\overline{45}$  has 2 repeating digits, multiply each side of  $x = 0.\overline{45}$  by  $10^2$ , or 100. Then  $100x = 45.\overline{45}$ .

$$100x = 45.\overline{45}$$

(2) Subtract  $x$  from  $100x$ .  
$$\begin{array}{r} 100x = 45.\overline{45} \\ - (x = 0.\overline{45}) \\ \hline 99x = 45 \end{array}$$

(3) Solve for  $x$  and simplify.  
$$\frac{99x}{99} = \frac{45}{99}$$
$$x = \frac{5}{11}$$

**Answer:** The decimal  $0.\overline{45}$  is equivalent to the fraction  $\frac{5}{11}$ .**Exercises for Examples 3 and 4**

Write the decimal as a fraction or mixed number.

9. 0.25

10.  $0.\overline{32}$

11.  $3.\overline{1}$

12. 7.325